

Monsanto MSDS Name: PHOSPHORUS PENTASULFIDE

Company:
MSDS Number: 001314803
MSDS Name: PHOSPHORUS PENTASULFIDE

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Phosphorus Pentasulfide

Issue Date: 06/02/92



Monsanto

Material Safety Data Sheet

PRODUCT NAME: PHOSPHORUS PENTASULFIDE

MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ST. LOUIS, MO 63167

FOR CHEMICAL EMERGENCY, SPILL LEAK, FIRE, EXPOSURE, OR ACCIDENT

Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere: 202-483-7616 (collect calls accepted)

For additional non-emergency information, call: 314-694-6661

PRODUCT IDENTIFICATION

Synonym(s):	Tetraphosphorus Decasulfide (P ₄ S ₁₀); Phosphoric Sulfide; Phosphorus Persulfide; Thiophosphoric Anhydride
Chemical Name:	Phosphorus Sulfide (P ₂ S ₅)
Chemical Formula:	P ₄ S ₁₀
Chemical Family:	Phosphorus Sulfides

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CAS No.: 1314-80-3

TSCA Inventory: Phosphorus Pentasulfide appears on the Inventory of Chemical Substances published by the U. S. Environmental Protection Agency (EPA) under authority of the Toxic Substances Control Act (TSCA).

DOT Proper Shipping Name: Phosphorus Pentasulfide

DOT Hazard Class/I.D. No./
Packing Group No.: 4.3 Dangerous When Wet/UN1340/PG II

DOT Label(s): Dangerous When Wet

Reportable Quantity(RQ)
Under U. S. EPA CERCLA
Regulations: Phosphorus Pentasulfide, 100 lbs. (45.4 kg)

U.S. Surface Freight Classification: Phosphorus Pentasulfide

SARA Hazard Notification

Hazard Categories Under
Criteria of SARA Title III
Rules (40 CFR Part 370): Immediate, Fire, Reactive

Section 313 Toxic Chemical(s): Not Applicable

Hazardous Chemical(s) Under OSHA Hazard Communication Standard:

This substance is identified as a hazardous chemical under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

WARNING STATEMENTS

DANGER!

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DEADLY GAS MAY BE PRESENT

FLAMMABLE SOLID & VAPOR

CONTACT WITH WATER, MOIST AIR OR ACID SLOWLY RELEASES POISONOUS AND FLAMMABLE

HYDROGEN SULFIDE WHICH MAY BE FATAL IF INHALED

CAUSES EYES, SKIN AND RESPIRATORY TRACT BURNS

HARMFUL IF SWALLOWED OR INHALED

NOTE: Hydrogen sulfide has a strong rotten egg odor, but may deaden sense of smell. Do not depend on odor to detect gas.

PRECAUTIONARY MEASURES

Before entering transport vehicle, ventilate to remove hydrogen sulfide gas.

Avoid friction or rough handling because of fire hazard.

Keep away from heat, sparks and flame.

Do not get in eyes, on skin, or on clothing. Wear chemical goggles, face shield, rubber gloves, and full protective clothing, including boots.

Avoid breathing dust or vapor. Handle only in areas with sufficient ventilation to prevent exposure or wear a suitable respirator or self-contained breathing apparatus. Wash thoroughly after handling.

Keep container tightly closed.

Use with adequate ventilation.

Wash thoroughly after handling.

CONTAINER HAZARDOUS WHEN EMPTY. Emptied containers retain vapor and product residue. FOLLOW LABELED WARNINGS EVEN AFTER CONTAINER IS EMPTIED. RESIDUAL VAPORS MAY EXPLODE ON IGNITION. DO NOT CUT, DRILL, GRIND OR WELD ON OR NEAR THIS CONTAINER. Improper disposal or reuse of this container may be dangerous and/or illegal.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID: IF IN EYES OR ON SKIN, immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Destroy contaminated shoes.

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IF INHALED, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. Contact a poison control center.

IF SWALLOWED, do NOT induce vomiting. Get medical attention. Contact a poison control center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

IN CASE OF FIRE: Use CO₂, sodium chloride base, dry chemical or dry sand. Do not use water spray, however, if water must be used apply large flooding volumes quickly.

IN CASE OF SPILL OR LEAK: Keep dry, sweep up and place in authorized containers. Flush area with water. People assigned to clean-up work should wear full protective clothing including self-contained breathing apparatus.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Where there is potential for eye contact, wear chemical goggles and have eye flushing equipment immediately available.

Skin Protection: Wear appropriate chemical resistant gloves and clothing to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wash immediately if skin is contaminated. Launder contaminated clothing and clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

Respiratory Protection: Avoid breathing dust, mist, or vapor. Use NIOSH/MSHA approved respiratory protection equipment (full facepiece recommended) when airborne exposure is excessive. If used, full facepiece replaces need for chemical goggles. Consult respirator manufacturer to determine appropriate type equipment for given application. Observe respirator use limitations specified by NIOSH/MSHA or the manufacturer. Respiratory protection programs must comply with 29 CFR § 1910.134.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Before entering transport vehicle or closed storage space, ventilate to remove Hydrogen Sulfide gas. Always test for gas before entering.

Airborne Exposure Limits:

Phosphorus Pentasulfide Wt. Wt. % 99.9 (CAS No. 1314-80-3)

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OSHA PEL: 1 mg/m³ 8-Hour TWA
OSHA STEL: 3 mg/m³ short term exposure limit
ACGIH TLV: 1 mg/m³ 8-Hour TWA
ACGIH TLV: 3 mg/m³ short-term exposure limit

Hydrogen Sulfide (liberated in presence of water) (CAS No. 7783-06-4)

OSHA PEL: 10 ppm (14 mg/m³) 8-Hour TWA
15 ppm (21 mg/m³) short-term exposure limit
ACGIH TLV: 10 ppm (14 mg/m³) 8-Hour TWA
15 ppm (21 mg/m³) short-term exposure limit

Phosphoric Acid (liberated in presence of water) (CAS No. 7664-38-2)

OSHA PEL: 1 mg/m³ 8-Hour TWA
OSHA STEL: 3 mg/m³ short-term exposure limit
ACGIH TLV: 1 mg/m³ 8-Hour TWA
ACGIH STEL: 3 mg/m³ short-term exposure limit

FIRE PROTECTION INFORMATION

Combustible powder (greenish yellow)

Melting Point: 527_F-536_F

Autoignition Temperature: 500-554_F (dust)
527_F (liquid)

Lower Explosive Limit: 14% by volume Phosphorus Pentasulfide

Extinguishing Media: Use CO₂, sodium chloride base, dry chemical or dry sand. Do not use water spray, however, if water must be used apply large flooding volumes quickly. If water is used, reaction will take place generating hydrogen sulfide. Guard against flash back and hydrogen sulfide poisoning.

Special Fire Fighting Procedures: Fire fighters and others exposed to products of combustion should wear full protective

clothing including self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

Unusual Fire and Explosion Hazards: In the presence of moisture, hydrogen sulfide, a deadly and flammable gas is liberated. Phosphorus pentasulfide dust, when mixed in sufficient quantities in air, will form explosive concentrations. Products of combustion include toxic sulfur dioxide and phosphorus pentoxide.

REACTIVITY DATA

Hydrogen Sulfide (H₂S) is liberated as a by-product of most known reactions of P₂S₅, e.g., with alcohols, phenols, mercaptans, amines, aqueous acids and dilute caustic solutions.

Materials to Avoid: Avoid contact with water from any source during storage - H₂S gas and phosphoric acid are liberated.

Hazardous Decomposition Products: Sulfur dioxide and phosphorus pentoxide are formed upon combustion.

Hazardous Polymerization: Does not occur.

HEALTH EFFECTS SUMMARY

The following information summarizes human experience and results of scientific investigations reviewed by health professionals for hazard evaluation of phosphorus pentasulfide and development of Precautionary Statements and Occupational Control Procedures recommended in this document.

Effects of Exposure

Skin contact and inhalation are expected to be the primary routes of occupational exposure to phosphorus pentasulfide. Phosphorus pentasulfide is considered, on the basis of single exposure (acute) animal tests, to be moderately toxic orally and corrosive to the eyes and skin. On contact with water or atmospheric moisture, phosphorus pentasulfide decomposes to hydrogen sulfide gas and phosphoric acid, both of which may be irritating to the eyes and respiratory tract. Phosphoric acid is also corrosive to eyes and skin. Exposure to hydrogen sulfide in low concentrations (<50 ppm) has been reported to cause headache, nervousness, nausea, cough, sleeplessness (insomnia), and eye irritation. Higher concentrations (50-500 ppm) cause irritation to the respiratory tract which may lead to bronchitis or bronchopneumonia if exposure is prolonged. Very high concentrations of hydrogen sulfide (500-2000 ppm) cause unconsciousness and can lead to death. Concentrations above

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2000 ppm can be instantly fatal. Repeated exposures to low concentrations (50-100 ppm) of hydrogen sulfide are reported to cause eye damage, including conjunctivitis, light sensitivity, tearing, pain and blurred vision. The irritation and tissue damage resulting from contact with phosphorus pentasulfide is considered to result, at least in part, from the hydrogen sulfide and phosphoric acid decomposition products. Due to the potential for phosphorus pentasulfide to produce severe respiratory tract irritation, workers with lung disease or limited respiratory capacity should have limited exposure to this material.

Hydrogen sulfide has the odor of rotten eggs and can be easily detected at low levels; however, this odor cannot be depended on to detect exposure to high or dangerous concentrations of hydrogen sulfide due to fatigue of the sense of smell at concentrations of 200 ppm or above.

Toxicological Data

Data from laboratory studies conducted by Monsanto with phosphorus pentasulfide are summarized below.

Single exposure (acute) studies indicate:

Oral - Moderately Toxic (Rat LD50 186 mg/kg)

Eye Irritation - Corrosive (Rabbit)

Skin Irritation - Corrosive (Rabbit, 24-hr exposure)

Additional Information

Additional toxicity data is available on the hydrogen sulfide and phosphoric acid decomposition products of phosphorus pentasulfide. Toxicity studies in rats show hydrogen sulfide to be toxic following single-dose inhalation. Hydrogen sulfide has been administered to many animal species (mouse, rat, rabbit, goat, cow, pig, primate) by single and repeated inhalation exposures to investigate its toxicity. While susceptibility of these animal species to hydrogen sulfide toxicity varies, overexposure has generally been shown to produce adverse effects on the brain, liver, lungs, kidneys, heart, nervous system and blood. Inhalation exposure to fatal or near fatal levels has produced respiratory distress and sudden loss of consciousness.

Following skin contact with hydrogen sulfide gas, adverse effects such as blood changes (rabbits), skin swelling, breathing difficulty and death (guinea pigs) were reported. No adverse effects were reported in dogs by this route of administration. No birth defects, adverse reproductive or genetic effects following exposures of animals to hydrogen sulfide have been reported.

Phosphoric acid produced no genetic changes in standard tests using bacterial cells.

Threshold Limit Values (TLVs) have been established by the American Conference of Governmental Industrial Hygienists for phosphorus pentasulfide and for its decomposition products hydrogen sulfide and phosphoric acid. For further information on these materials, please refer to the current edition of the Documentation of the Threshold Limit Values and Biological

Exposure Indices.

PHYSICAL DATA

Appearance:	Greenish yellow powder - Hydrogen Sulfide
Odor:	(Rotten-egg) odor
Melting Range:	279-283_C
Vapor Pressure @ 300_C:	1 mm Hg
Specific Heat (solid):	0.15 \pm 0.02 cal/g_C
Heat of Combustion:	2135 KCal/mole P4S10
Solubility in CS @ 17_C:	0.22 g/100 g solvent
Bulk Density (powder):	1.1-1.3 g/cc
Boiling Point (760 mm Hg):	513-515_C

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

SPILL, LEAK, & DISPOSAL INFORMATION

Emergency Spill and Leak Information: Keep dry, sweep up and place in authorized containers. Flush area with water. People assigned to clean-up work should wear full protective clothing including self-contained breathing apparatus.

Disposal Information: Phosphorus Pentasulfide U189, is a hazardous waste under RCRA Regulations 40 CFR 261.33 (b). Local, state and federal regulations should be followed in disposing of this material.

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ADDITIONAL INFORMATION

Refer to Monsanto Technical Bulletin No. 123, "Phosphorus Pentasulfide", for additional information on handling and storing.

DATE: 6/2/92

SUPERSEDES: 5/55/89

MSDS NUMBER 001314803

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